MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2215)

DBM5614 – MATHEMATICS

(*for Diploma students only*)

24 FEBRUARY 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

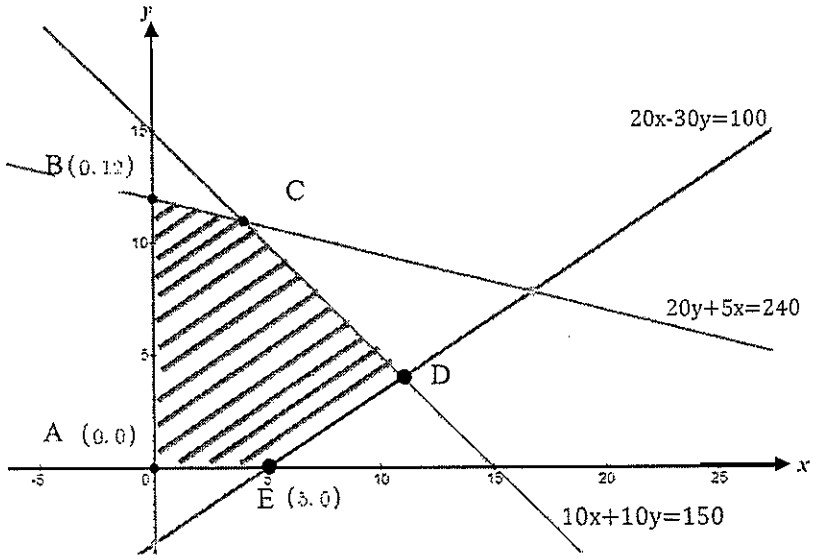
1. This question paper consists of **3** pages excluding cover page and appendix.
2. Attempt **ALL FOUR (4)** questions. The marks distribution for each question is given.
3. Write your answers in the answer booklet provided.
4. Key formulae are given in the Appendix.

Question 1

GEL-CUMULUS 24 TR
Men Running Shoes
RM 499.00

GT-1000 11 TR
Men Running Shoes
RM 399.00

a. Asics just released 2 model of running shoes, the *Gel-Cumulus 24 TR* (x) and *GT-1000 11 TR* (y). The market research was conducted prior to the release and the risk and perception of the markets are shown in the graph below:



i. State the linear inequalities obtained from the graph above. (4 marks)

ii. From the graph, find the coordinate of **Point C**. (6 marks)

iii. From the graph, find the coordinate of **Point D**. (6 marks)

iv. Based on the price in the images above, state the profit function if the profit is 20% from the final selling price. (3 marks)

v. Evaluate all the five corner points and determine the maximum profit based on the objective function in (**iv**). (6 marks)

b. A café is preparing a breakfast menu consist of pancakes and waffles. A batch of pancake needs 3 cups of baking mix, 1 cup of milk, and 2 eggs. A batch of waffles require 2 cups of baking mix, 2 cups of milk, and 2 eggs. The host requested to have more pancakes than the waffles. They have 24 cups of baking mix, 18 cups of milk, and 20 eggs in store. List all the constraints according to the situation. (5 marks)

[TOTAL 30 MARKS]

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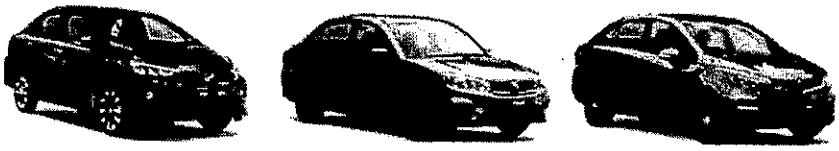
Question 2



Model	Perodua Bezza 1.3 AV	Proton Saga 1.3 Premium	Proton Persona 1.6 Executive
Price (RM)	49,980	39,800	49,600

Public Bank Aitab Hire Purchase-i

Profit Rate	Tenure
3.31% p.a.	over 9 years

KFH Automobile Ijarah-i

Profit Rate	Tenure
3.38% p.a.	over 9 years

Maybank My First Car Loan

Interest Rate	Tenure
3.4% p.a.	over 9 years

a. You found an advertisement above when looking for your first car to buy. After collecting some opinion from friends and family, you decided to buy Proton Persona. The car dealer recommended you to take loan from Maybank. However, after checking from the website, you get the info as the picture above and would like to process your loan with Public Bank. Both of the banks will finance the balance of the car price after you pay 10% deposits.

i. Calculate the amount of loan that you will take from the bank. (2 marks)
ii. What is the monthly payment if you choose Maybank to finance the car? (5 marks)
iii. How much is the monthly payment offered by Public Bank? (5 marks)
iv. Find the difference between the monthly payment of the two banks. (2 marks)

b. Instead of taking loan to buy the car, you ponder upon the idea of saving every 3 months RM500 for 9 years into an account paying 3% interest compounded quarterly.

i. How much will you have in the account after 9 years? (4 marks)
ii. How much interest have you earned? (2 marks)

c. You found a bank that gives you interest of 2.55% compounded monthly. How much do you need to put into the bank every month to reach a total of RM100,000 after 9 years. (5 marks)

Continued...

d. You have a monthly liability commitment of RM1,176. Total monthly liability commitment you can afford is RM2,200. Based on these, if you would like a bank to finance your house purchase for 35 years. What is the maximum price of the house that you can afford with an interest of 2.88% p.a. compounded monthly? (5 marks)

[TOTAL 30 MARKS]

Question 3

a. Given a function $y = \frac{46x^3 - 4x}{2x^2} + e^x - 2\ln x$. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$. (9 marks)

b. Find the first derivative of $f(x) = \sqrt{x^3 + 4x}$ by using **Chain Rule.** (4 marks)

c. Below is the total cost function of *Sumsum* company, where q is the number of unit produced.

$$C(q) = \frac{q^5 - 2000}{10 - q}$$

i. Find the marginal cost function, $C'(q)$. [Hint: use **Quotient Rule**] (5 marks)

ii. Find the marginal cost when the company produces 5 units. (2 marks)

[TOTAL 20 MARKS]

Question 4

a. Evaluate each of the following integrals.

i. $\int 3\left(2x^{11} - x^2\right)dx$ (4 marks)

ii. $\int_4^9 (3x^{\frac{1}{2}} - 1)\,dx$ (5 marks)

b. Solve $\int \frac{12}{\sqrt{77 - 3t}}dt$ by using **Substitution Rule.** (5 marks)

c. A manufacturer's marginal revenue function is $\frac{dR}{dx} = 2x^5 - 4x^3 + 6x$, where x is the number of units produced. Determine the total revenue function, $R(x)$, of producing 0 to 5 units. (6 marks)

[TOTAL 20 MARKS]

End of Page.

APPENDIX 1: FORMULAE

Simple Interest	***Compound Interest***
$I = Prn$	$FV = PV\left(1+\frac{r}{n}\right)^{nt}$
Present Value Annuities	***Future Values Annuities***
$A = R\left[\frac{1-\left(1+r/n\right)^{-nt}}{r/n}\right]$	$S = R\left[\frac{\left(1+r/n\right)^{nt}-1}{r/n}\right]$

Product Rule	***Quotient Rule***	***Chain Rule***
$\frac{d}{dx}[f(x)\cdot g(x)] = fg'+gf'$	$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{gf'-fg'}{g^2}$	$\frac{d}{dx}f[g(x)] = f'[g(x)]\cdot\frac{d}{dx}g(x)$
Logarithm Rule	***Properties of logarithm***	***Exponential Functions***
$\frac{d}{dx}\ln u = \frac{1}{u}\cdot\frac{du}{dx}$	$a\ln x = \ln x^a \qquad \ln e = 1$	$\frac{d}{dx}e^u = e^u\frac{du}{dx}$

Integration	
$\int k\,dx = kx + C$	$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq 1$
$\int e^x\,dx = e^x + C$	$\int \frac{1}{x}\,dx = \ln x + C$

Definite Integral

$\int_a^b f'(x)\,dx = f(b) - f(a)$